High Phase Order Electrical Rotating Machine with Distributed Windings

Technical Field

The present invention relates to winding distributions in rotating electrical machines.

Background Art

Previously disclosed, in application number 09/255,291 and in U.S. Patent No. 6,351,095, have been High Phase Order electrical rotating machine designs. Of specific interest is the application "HIGH PHASE ORDER MOTOR WITH MESH CONNECTED WINDINGS," 09/713,654, filed November 15, 2000, now Patent Number 6,657,334, which discloses the use of a high phase order concentrated winding machine, connected to an inverter using a mesh connection. When using a mesh connection, the voltage across each winding is a function related to the voltages of both of the two inverter legs that drive that winding, and therefore, may be different from the actual voltages produced by the inverter legs. That machine is deliberately operated either with a fundamental drive waveform, a pure harmonic drive waveform, or admixtures of these, in order to change the volts/hertz ratio of an induction machine, in order to increase the power delivered to the machine by a power electronics drive system when the motor was being operated at low speed and thus reduced slot voltage. In other words, the motor can be operated at higher current than the currents produced in the inverter.

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In my previously disclosed machines, extensive use was made of concentrated windings. Concentrated windings place inductors of a single phase in a single slot in each pole of a stator. Motor windings are usually produced using coils of wire, with the portion of a coil residing in one slot forming the inductors for that slot, and the portion of the same coil on the opposite side of the coil is placed in another slot, forming a set of inductors with reverse polarity from the first. These two slots are placed 180 electrical degrees apart, forming so-called full span concentrated windings.

Concentrated windings offer numerous benefits, including the ability to use harmonic components of drive currents to produce useable rotating fields, reduction in chording and distribution factors, which reduce resistance losses, and the ability to use specific harmonic drive waveforms to obtain desired changes in machine impedance. However the use of concentrated